

For each of the following differential equations...

- (a) Try to “separate” the equation; that is, try to write it as $f(y) dy = g(x) dx$.
- (b) If you are successful in part (a), solve the differential equation by integrating the separated equation. (If the equation is not separable, you do not need to solve it.)
- (c) Find the solution with the given initial condition (for example, $y(1) = 5$ is the solution for which $y = 5$ when $x = 1$).

1 $y' = x^2y$ $y(0) = 2$

2 $y' = \frac{x^2}{y}$ $y(0) = -2$

3 $y' = x^2 + y$ $y(1) = 1$

4 $y' = e^{x+y}$ $y(0) = 0$

5 $y' = \frac{x^2}{\sqrt{y}}$ $y(1) = 4$

6 $\sqrt{xy} y' = 1$ $y(0) = 1$

Answers:

1 $2e^{x^3/3} + 4$ 2 $e^{x^3/3} - 2$

3 Not separable 4 $e^{-x} \ln(x^2 - 2)$

5 $\frac{2}{3} \sqrt{\frac{x^3}{3} + 1} = \frac{2}{3} \sqrt{\frac{x^3}{3} + 1}$ 6 $\frac{2}{3} \sqrt{\frac{x^3}{3} + 1} = \frac{2}{3} \sqrt{\frac{x^3}{3} + 1}$